FLUORINE PROFILES IN ACHONDRITES AND CHONDRITES FROM ANTARCTICA BY NUCLEAR REACTION ANALYSIS (NRA). K. Noll, M. Döbeli[1,2], L. Tobler[2], D. Grambole[3] , U. Krähenbühl, Depart. of Chemistry and Biochemistry, Universität Bern, Freiestr. 3 CH-3000 Bern 9, [1]Ionenstrahlphysik, ITP, HPK-H4, ETH Zürich, CH-8093 Zürich, [2]Paul Scherrer Institut PSI, CH-5232 Villigen, [3] Research Center Rossendorf, Postfach 510119 D-01314 Dresden

Depth-profiles of fluorine concentration give valuable information about exposure history and terrestrial contamination of meteorites found on the Antarctic ice [1]. The analysis technique consisted in the past of stepwise removal of surface layers followed by pyrohydrolytic separation of the fluorine and its determination by ion sensitive electrode (ISE). This approach was very time consuming. Thus, a faster instrumental technique was sought. Proton beam induced nuclear reaction analysis (NRA) is a well suited method for instrumental detection of fluorine [2]. The most common reaction in use is $^{19}F(p,a\ g)^{16}O$ and its multiple g-emission around 6 MeV can be measured easily. Detection limits in the lower ppm range were obtained. Usually, depth-profiles are gained by varying the proton energy around a reaction's sharp resonance peak. However, the range of such resonance profiling is limited to a few micrometers. For Antarctic Meteorites, where the profile-depth can extend to several millimeters, profiles have to be obtained by scanning a focused beam across a laid open inner face of the meteorite, perpendicular to its surface. Experiments were done with the PSI/ETH-Tandem accelerator and a proton energy of 2.7 MeV. Line shaped beam spots of 2 mm length and 350 mm spatial resolution in profile direction were used. The long extension of the beam spot, parallel to the surface, produces an averaged fluorine content without influence from grain texture. The beam was raster scanned across the target and 2-dimensional spectra (depth versus. g-energy) were recorded.. A comparison between data obtained by the old method and the NRA technique with ALHA79025 shows fair agreement [3].

We extended our measurements to achondrites. Results for ALH84001 show no detectable fluorine at all, neither on the exterior crust nor in the profile. With our current detection limit of about 10 ppm, and under the assumption of similar fluorine-contamination rates as for Allan Hills' chondrites, this implies an exposure duration on the ice surface of less than 1000 years. Figure 1 illustrates the very different contamination in fluorine of ALHA79025 and ALH84001:

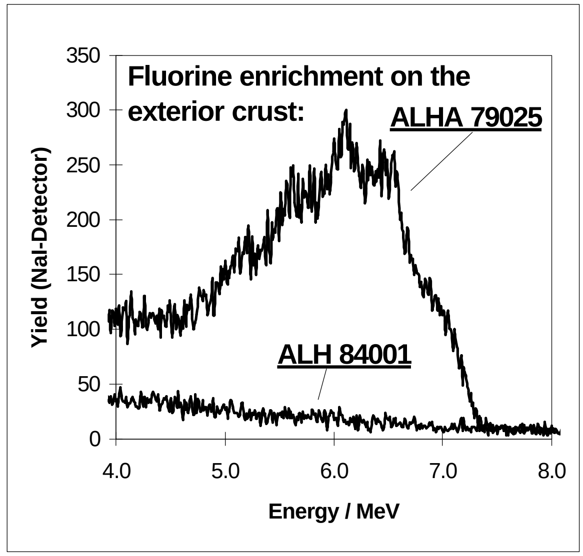

Fig.1 NRA-g-Spectra from the reaction $^{19}F(p,a\ g)^{16}O$ of chondrite ALHA79025 (380±20mg/g F on the exterior crust; interior concentration about 9 mg/g) and of achondrite ALH84001 (<10mg/g F exterior and interior concentration).

Further measurements of achondrites and improvements in the detection limits are in progress. In addition, the F-content of ALH84001 will be examined independently by means of the $^{19}F(p,p'\ g)^{19}F$ reaction. Results of this current research will be presented, including estimations of the time span these meteorites laid on the surface of the Antarctic ice.

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